INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title:
Studies on the self-assembly of some heterocycle containing star-shaped and polycatenar mesogens

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SHORT ABSTRACT

This thesis entitled *"Studies on the self-assembly of some heterocycle containing star-shaped and polycatenar mesogens"* have been divided into four chapters. Contents included in this thesis are based on the research output gained from my research program. Chapter 1 is an introductory chapter to liquid crystals (LCs) with their brief history and classification. Since this thesis deals with non-conventional LCs, the self-assembly of star shaped and polycatenar LCs were given more emphasis. Chapter 2 presents a systematic study on the molecular structure and resulting self-assembly behavior of star-shaped molecules in liquid crystalline state. This chapter demonstrates how a subtle change in the molecular structure through peripheral substitution alters the liquid crystalline self-assembly. Chapter 3 describes the effect of molecular structure in terms of the type of the heteroatom as well as the number and position of peripheral chains on the liquid crystalline and photophysical behavior of thiophene based polycatenars. The number, length and position of substitution of the peripheral tails and the type of the heterocycle moiety adjacent to the thiophene ring greatly affected the self-assembly of the molecules in the LC and gel states. The impact of an atomic-scale difference (oxygen to sulfur, <2% of the molecular weight) on the self-assembly and the macroscopic properties of these self-assembled compounds are clearly visualized. Chapter 4 presents a new class of bent shaped polycatenars containing central pyridine moiety. Here also the effect of heterocycle and the number of peripheral tails

present in the polycatenars on the liquid crystalline and organogel self-assemblies were studied. These structural differences also affected the photophysical properties. Additionally, these molecules exhibited the ability to sense the acid vapors due a quenching/shifting in the emission spectrum, which makes it possible to detect the acids by naked eye. Thus the thesis presents a detailed account of the molecular structure-property relationship with respect to the liquid crystalline self-assembly, organogelation and photophysical behavior of the star-shaped and polycatenar mesogens.